## REMARKS/ARGUMENTS

The specification has been amended on page 44 (lines 4-7) to provide a brief definition of the modified phthalazine toning agents referenced and incorporated by reference from U.S. Patent 6,605,418 (Ramsden et al.).

Claims 1, 7, 20 and 23 have been amended to incorporate the subject matter of cancelled Claim 14. Thus, it is clear that the claimed compositions and photothermographic materials relate to "aqueous-based" materials that are coated predominantly out of aqueous coating solvents and formulations as described on page 49, lines 21-27 of the present application. The binders in such compositions and materials are then by necessity hydrophilic or water-dispersible polymeric latexes. All amended claims are clearly supported by the original disclosure.

New Claim 34 calls for certain toners in the thermally developable imaging layers of Claim 7 as defined on pages 44 (lines 22-31) and 45 (lines 4-7, now amended). Thus, the subject matter of this claim is fully supported by the original disclosure.

New Claim 35 calls for a select group of polycarboxylic acid stabilizers, all of which are described on page 42 (lines 1-3) of the original disclosure.

Rejections I-IX:

Several rejections have been made in paragraphs 1-5 and 7-9 of the Office Action, listed as follows:

I. In paragraph 1, Claims 1, 2, 4, 6-8, 11-15, 17, 26, 28, and 30 have been rejected as being unpatentable over U.S. Patent 4,584,267 (Musakawa et al.) in view of Gutman.

II. In paragraph 2, Claims 1-4, 6-15, 17, 26, 28, and 30 have been rejected as unpatentable over U.S. Patent 4,772,544 (Hirai et al.) in view of Gutman.

III. In paragraph 3, Claims 1, 2, 4-8, 11-28, 30, and 31 have been rejected as unpatentable over U.S. Patent 6,165,707 (Hirano et al.) in view of Gutman.

IV. In paragraph 4, Claims 5, 16, and 20-22 have been rejected as unpatentable over Hirai et al. with Gutman and Hirano et al.

V. In paragraph 5, Claims 18-25 and 27-33 have been rejected as unpatentable over Musakawa et al. with Gutman and Hirai et al.

VI & VII. In paragraph 7, Claims 1, 2, 4, 6-8, 11-15, 17, 26-28, and 30 have been rejected as anticipated by or unpatentable over Gutman.

VIII. In paragraph 8, Claims 5, 16, and 20-22 have been rejected as unpatentable over Gutman with Hirano et al.

IX. In paragraph 9, Claims 18, 19, 23-25, and 27-33 have been rejected as unpatentable over Gutman with U.S. Patents 4,480,024 (Lyons et al.) and

As far as it applies to claims presently in this application each rejection is respectfully traversed and will be addressed in turn after a brief description of the presently claimed invention.

The ability of a black-and-white photothermographic material to be stored without undergoing changes in sensitometric or physical properties is often referred to as "raw-stock keeping" or "natural age keeping". One aspect of improving raw-stock keeping is the control of fog during storage. Fog is spurious image density that appears in non-imaged areas of the element after development and is often reported in sensitometric results as $D_{min}$. In efforts to make more sensitive photothermographic elements, one of the most difficult parameters to control and to maintain at a very low level are the various types of fog or $D_{min}$.

Black-and-white photothermographic materials contain both the image-forming chemistry and the development chemistry in one or more thermally developable imaging layers. Thus, during storage and prior to use, the image-forming and development chemistry may degrade or may prematurely chemically react. Later, upon imaging and development, this reaction will be observed as an increase in $D_{min}$ in the non-imaged areas. This reaction shortens the shelf-life of black-and-white photothermographic materials and is often referred to as "shelf-aging fog".

The presence of water from aqueous coating solvents makes the problems worse in photothermographic materials. Residual water tends to cause premature reactions or break down of imaging components, thereby exacerbating the fog problems ($D_{min}$ increase) described above during storage.

The present invention provides a solution to this "shelf aging fog" problem with the use of specific polycarboxylic acid compounds in combination with specific organic silver salts and reducing agents, and particularly in aqueous-based black-and-white photothermographic materials. The use of certain polycarboxylic acid compounds has been observed to reduce changes in Dmin upon storage. Without defining a mechanism for use of the polycarboxylic acid compounds, it is believed that these compounds act as silver scavengers or silver coordinating agents that prevent silver catalysis of further development and thus provide desirable natural age keeping results.

TABLE II (page 71) of the present application provides data showing the advantageous effects from the presence of specific polycarboxylic acids having a pKa of less than 4.5 compared to their absence (Sample 1-1). The change in $D_{min}$ ($\Delta D_{min}$) after ten weeks of aging is much less (below 1.0) for the samples of the present invention (Samples 1-2, 1-3, 1-4, 1-5, 1-6, 1-8, and 1-11) compared to the Control (Sample 1-1, $\Delta D_{min}$ of 1.747).

In addition, Applicants compared the materials of the present invention with similar materials that included carboxylic acids outside the scope of the invention (Samples 1-7, 1-9, and 1-10). The change in $D_{min}$ was much higher (over 1.0) for those Comparative samples. Based on this information, it was not predictable from Applicants' understanding of the literature directed to photothermography that only specific polycarboxylic acids of Applicants' claims would provide these advantages.

Response to Rejection I:

The Office Action alleges that Masukawa et al. describes photothermographic elements comprising silver halide, organic silver salts, reducing agents and toners. The preferred silver salt is said to be silver benzotriazole and the preferred reducing agent is said to include ascorbic acid. The toning agents are said to include phthalic acid that would be encompassed within Applicants' claims. Gutman is applied for its disclosure that ascorbic acids are preferably used with silver benzotriazole in photothermographic materials. Thus, the Office Action alleges that it would be obvious for a skilled artisan to use the ascorbic acids in the materials of Masukawa et al. containing silver benzotriazole and phthalic acid.

Applicants disagree with the rejection based on these two references. Masukawa et al. is directed to color imaging materials designed for color diffusion transfer, hardly relevant to Applicants' black-and-white materials in which an image of metallic silver is formed. In addition, the laundry list of organic silver salts useful in diffusion transfer hardly provides any guidance as to what specific silver salts would be useful in the presently claimed invention. Further, the laundry list of reducing agents in Masukawa et al. fails to provide any motivation for choosing ascorbic acid reducing agents for specific types of imaging chemistries in the presently claimed invention. Ascorbic acid is listed among potentially hundreds of useful reducing agents and there is no reason given in the reference to use it in combination with specific organic silver salts and polycarboxylic acids.

Moreover, Masukawa et al. fails to provide motivation for choosing Applicants' polycarboxylic acids to solve the "shelf aging fog" problem described above. The few polycarboxylic acids described in the patent are used in combination with phthalazine in "toner systems" (Col. 30, lines 49-60).

Thus, this primary reference has two very lengthy laundry lists of imaging components without any suggestion that specific compounds from each list should be combined for any reason, let alone to solve the "shelf aging fog" problem described above. In Examples 1-3, Masukawa et al. describes only dye-forming materials and ascorbic acid is not used as the reducing agent. Moreover, the examples teach that a fogging problem is solved with the use of a certain hydrophilic binder, not with a combination of imaging components.

The Office Action alleges that Gutman supplies the motivating teaching that is missing in Musakawa et al.

Applicants respectfully submit that Gutman fails in this regard. While this reference teaches the use of ascorbic acids with silver benzotriazole, it fails to suggest this combination of components in aqueous-based photothermographic materials for solving the problem of "shelf aging fog". Gutman is directed to solving a fogging problem using specific toner systems that may include a carboxylic acid, but that problem is not the same problem addressed by the presently claimed invention. Moreover, there is no reasonable expectation that what will solve one type of fogging problem will solve another. Thus, the combined teaching of Gutman with Masukawa et al. fails to motivate a skilled

worker to put Applicants' specific combination of components together in solve a problem that is not appreciated in the art, and the noted rejection should be withdrawn.

Response to Rejection II:

The Office Action alleges that Hirai et al. discloses all of the components of the claimed invention except the use of ascorbic acid as a reducing agent. Hirai et al. is considered to describe the set of polycarboxylic acids in Applicants' Claim 2. The missing teaching is said to be supplied by Gutman. Thus, it is alleged that it would be obvious to a skilled artisan to use ascorbic acid in the photothermographic materials of Hirai et al.

Applicants respectfully submit that this combination of references also fails to teach or suggest the presently claimed invention. Harai et al. is directed to "color" photothermographic materials in which an acid (organic or inorganic) having a pKa of 7 or less is added to reduce fogging during development. The inorganic acids are "especially" preferred (Col. 2, lines 9-13). There is no mention of a "shelf aging fog" problem that is addressed by the present invention. Moreover, within the laundry list of dozens of potential acids (Cols. 1-6) are a number of acids that are outside the scope of the presently claimed invention, including lactic acid, boric acid, pyrophosphoric acid, tripolyphosphoric acid, phosphoric acid, sulfuric acid, hydrochloride acid, nitric acid, butyric acid, benzoic acid, benzenesulfonic acid, glutamic acid, acetic acid, formic acid, glycolic acid, and glutamic acid. Applicants have shown lactic acid (TABLE II, page 71, Comparative Sample 1-7) as failing to solve the shelf aging problem. Furthermore, Harai et al. includes as a potentially useful acid, ascorbic acid. Applicants use ascorbic acid as a reducing agent that contributes to the "shelf aging fog" problem that is solved by the presently claimed invention (TABLE II, Sample I-1, containing ascorbic acid but no stabilizer).

There is no direction in Harai et al. as to which acids, among dozens of potential acids, will solve an unappreciated problem in black-and-white, aqueous-based photothermographic materials. In view of this lack of teaching and Applicants' showing of unexpected results, it is clear that the presently claimed invention is unpredictable.

Gutman fails to overcome this deficiency in Harai et al. As noted above, it is directed to organic solvent-based photothermographic materials in contrast to Applicants' aqueous-based materials. While Gutman describes the use of ascorbic acid as a reducing agent with silver benzotriazole, it fails to appreciate the "shelf aging fog" problem, or that a select group of polycarboxylic acids will solve that problem in black-and-white, aqueous based photothermographic materials. Thus, the combination of Harai et al. with Gutman fails to suggest a selection of polycarboxylic acids to solve an unappreciated problem and the rejection based on these two references should be withdrawn.

Response to Rejection III:

The Office Action alleges that Hirano et al. discloses components of Applicants' claimed invention including ascorbic acid reducing agents and phenyl dicarboxylic acids as storage stabilizers. Gutman is cited again for its teaching of the combination of ascorbic acid with silver benzotriazoles. Thus, it is alleged that the claimed invention would be obvious to a skilled artisan in view of the combined teaching.

Applicants respectfully disagree and submit that Hirano et al. would not motivate a skilled artisan to pick out a select class of polycarboxylic acids to stabilize the photothermographic materials against "shelf aging fog". The "stabilizers" described in Hirano et al. encompass hundreds of aromatic compounds. Yet, Applicants have demonstrated in their comparative results (TABLE II, page 71-72) that not every aromatic carboxylic acid will reduce "shelf aging fog" (see e.g. Sample 1-10). Thus, there is no predictability in what polycarboxylic acids will work and which will not, and Hirano et al. fails to provide direction for making the appropriate choices.

Moreover, Hirano et al. teaches an extensive list of organic silver salts and reducing agents. Again, there is no direction in the reference to pick out certain imaging components to combine with certain polycarboxylic acids to solve the shelf aging problem. While Gutman provides teaching about silver benzotriazoles and ascorbic acid, as pointed out above, it is directed to solvent-based materials and fails to suggest combining those components with specific polycarboxylic acids in an aqueous system. Thus, the rejection based on these two references is faulty and should be withdrawn.

Response to Rejection IV:

Claims 5, 16, and 20-22 have been rejected over the combination of Hirai et al., Gutman, and Hirano et al. because Hirano et al. is said to teach the use of tabular silver halide grains. Applicants respectfully disagree with this rejection for the same reasons stated above in response to Rejections II and III. In particular, Claim 20 calls for a combination of many specific imaging components and specific polycarboxylic acids, and this specific combination of features is even further removed from any suggestions in the cited art. The three cited references fail to provide any direction to make the claimed combination from the lengthy lists of silver salts, reducing agents, and organic acids, and in particular since Hirano et al. includes within its list of acids some compounds that are known to be unacceptable (e.g. lactic acid) in the presently claimed invention. Thus, there is too much unpredictability and too many possible combinations of components derivable from the three references to render Applicants' more specific embodiments unpatentable. This rejection should also be withdrawn.

Response to Rejection V:

The Office Action alleges that Claims 18-25 and 27-33 are also unpatentable in view of Masukawa et al., Gutman, Hirai et al., Hirano et al., Lyons et al., and Simpson et al. It appears that the Examiner has found one or more components of one or more claims in each reference and thus believes that the cumulative teaching would render unpatentable the specific embodiments of the rejected claims.

Masukawa et al., Gutman, Hirai et al., and Hirano et al. have been addressed above. Lyons is cited for its alleged teaching of using photothermographic materials in combination with intensifying screens and Simpson et al. is cited for its alleged teaching about the use of "dual coated" elements for recording X-rays.

While Applicants do not agree on the merits of the rejection, they are not relying on the use of screens or phosphors for patentability. Rather, the claimed invention is patentable over the combined teaching because this combination of 6 references is no more effective to support the rejection than the combinations of any two or three references addressed in previous comments.

Neither Lyons et al. nor Simpson et al. overcomes the problem with the cited art that provides lengthy laundry lists of silver salts, reducing agents, and acids (both organic and inorganic) without any direction as to which ones of each group are useful together in black-and-white, aqueous-based photothermographic materials, in spite of the fact that Applicants' showing of comparative results indicates that it is clearly unpredictable as to which polycarboxylic acids will solve the "shelf aging fog" problem. Thus, the rejection over the 6 references should be withdrawn.

Responses to Rejections VI and VII:

In paragraph 7 of the Office Action, Claims 1, 2, 4, 6-8, 11-15, 17, 26-28, and 30 have been rejected as being anticipated by Gutman (Rejection VI).

Gutman describes organic solvent-based photothermographic compositions and materials containing hydrophobic, organic solvent-soluble binders (Col. 5, lines 17-20 and 39-47 and Example I, Col. 6, lines 1-5 and 24-35). The presently claimed invention is directed to aqueous-based photothermographic compositions and materials coated out of aqueous solvents and containing hydrophilic or water-dispersible latex binders. These features of the claimed invention are not described in Gutman so it fails to anticipate the claimed invention. Applicants therefore believe that this rejection should be withdrawn.

With respect to the unpatentability rejection (Rejection VII) of the same claims, Applicants respond that while Gutman expresses a preference for silver benzotriazole with ascorbic acid, it does so only for solvent-based materials. Moreover, it fails to address the need for a specific class of polycarboxylic acids with these imaging components in aqueous-based materials to solve the "shelf aging fog" problem, a problem incidentally that is unappreciated by Gutman. Thus, it is only by considering the selective combinations taught by Applicants for their stated purpose that one skilled in the art would consider the claimed invention obvious in view of Gutman. The incidental teaching about toning systems containing phthalic acid does not address the problem nor suggest its solution.

Response to Rejection VIII:

The rejection of Claims 5, 16, and 20-22 over Gutman with Hirano et al. has no more merit than the rejection of the same claims over Hirai et al., Gutman, and Hirano et al. For the sake of brevity, Applicants direct attention to their response to Rejection IV above and incorporate it here with the exception that the reference to Hirai et al. is unnecessary. Applicants have demonstrated the unpredictability of using certain polycarboxylic acids to solve the "shelf aging fog" problem since some of the organic acids taught in Hirano et al. are ineffective and the reference fails to teach a skilled worker how to choose the effective organic acids from the hundreds of possible organic and inorganic acids.

Response to Rejection IX:

The rejection of Claims 18, 19, 23-25, and 27-33 over Gutman, Lyons et al., and Simpson et al. is also traversed. The Office Action alleges that Gutman describes photothermographic compositions containing various imaging components including silver benzotriazoles and ascorbic acids. It also alleges that the acid toners in Gutman are relevant to the presently claimed invention. Lyons et al. and Simpson et al. are cited for their teaching of intensifying screens, phosphors in imaging compositions, and imaging layers on both sides of the support.

Since Applicants are not relying on the phosphors and intensifying screens for patentability, Applicants would point out that the various dependent claims relate back to patentable independent claims for reasons already stated above. With respect to Claim 23, Applicants would point out that Gutman is directed to organic-solvent based materials, not aqueous-based materials in which the "shelf aging fog" problem is most pronounced. Neither Lyons et al. nor Simpson et al. would direct a skilled worker in the art to use a specific combination of silver salt, reducing agent, and polycarboxylic acid to solve the "shelf aging fog" problem in aqueous-based photothermographic materials. Thus, the secondary references add nothing to overcome the deficiencies in Gutman. For these reasons, the rejection should be withdrawn.

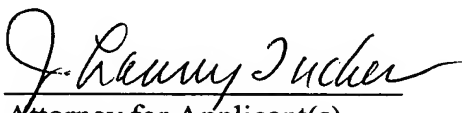
Response to Remarks in Paragraph 6:

In paragraph 6 of the Office Action, the Examiner states that Applicants' comparative results are inadequate as they allegedly fail to show the criticality of using silver benzotriazole and ascorbic acid. It is also alleged that it would be obvious to one skilled in the art to use toning agents including phthalic acid even if it has a secondary property of increasing stability.

Applicants respond that the combination of silver salt, reducing agent, and specific polycarboxylic acid is not obvious because the unpatentability rejections are based on citations that include lengthy lists of compounds from each class without any direction to pick out specific classes of all components required for use in aqueous-based black-and-white materials to solve an unappreciated problem. The main references of Masukawa et al., Hirai et al., and Hirano et al. are all directed extensively to solving problems prevalent in "color" imaging, or to fogging problems during development, not while on the shelf. Both Hirai et al. and Hirano et al. describes dozens of potential acids (both organic and inorganic with the inorganic acids preferred in Hirai et al.) for various uses but fail to suggest a specific class that would solve the "shelf aging fog" problem. Applicants have demonstrated in their comparisons that the use of specific polycarboxylic acids is critical and that it is unpredictable as to which acids will solve the problem. In fact, lactic acid (described in Hirai et al.) and another aromatic acid (like those described in Hirano et al) failed in Applicants' tests. How could anyone skilled in the art know to pick out only certain useful polycarboxylic acids if there is no suggestion provided in the art? Thus, the claimed invention is clearly patentable despite a lack of comparative results directed to the silver salts and reducing agents.

In view of the foregoing amendments and remarks, reconsideration of this patent application is respectfully requested. A prompt and favorable action by the examiner is earnestly solicited.

Respectfully submitted,



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